

# The Hypo/Hyperglycemi c Patient

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# Hypo/Hyperglycemia

✿ Hypoglycemia

→ low blood sugar

✿ Hyperglycemia

□ high blood sugar

# What is Diabetes Mellitus?

# Diabetes Mellitus

- ✿ Disease complex resulting from lack of insulin
  - ➔ Low output of insulin from pancreas
  - ▮ Unresponsiveness of peripheral tissues to insulin
- ✿ Metabolic component:
  - ▮ Increased blood glucose from lack of insulin.
  - ▮ Changes in lipid protein metabolism
- ✿ Vascular component:
  - ▮ Atherosclerosis
  - ▮ Microangiopathy affecting the kidneys and eyes

# Diabetes Mellitus

## ✿ What is the Incidence?

- 16+ million people
- ▢ healthcare and lost work time = \$90 billion
- ▢ Third leading cause of death
- ▢ 25% end stage renal disease
- ▢ 20,000 amputations per year

# What does insulin do?

- ✿ In a healthy patient:
  - insulin secretion tightly controlled
  - ▢ constant blood glucose level is maintained (65-110 mg/100ml of serum)
  - ▢ blood glucose rises and falls in response to meals

# What does insulin do?

- ✿ Transfers glucose from blood to insulin-dependent tissues.
- ✿ Stimulates the transfer of amino acids from blood to cells.
- ✿ Stimulates the synthesis of triglycerides from fatty acids.
- ✿ Inhibits the breakdown of triglycerides for the mobilization of fatty acids.

# What does insulin do?

- ✿ Glucose stimulates humans' insulin secretion
- ✿ Regulates carbohydrates, fat, and protein metabolism.
- ✿ Needed for muscle, fat, and liver to utilize glucose from the blood. "insulin dependent tissues"
- ✿ When insulin is insufficient or the action of insulin is insufficient, glucose accumulates in the tissue fluids and blood.

# What is the result?

- ✿ Glycosuria and polyuria result due to the kidneys not being able to reabsorb the excess glucose.
- ✿ Polydipsia is in response to fluid loss (polyuria).
- ✿ Polyphagia occurs to compensate for glucose loss, but there is still weight loss.

# What is the etiology?

✿ **Diabetes mellitus** can occur due to:

- A genetic disorder
- Destruction of the islets of Langerhans
- An endocrine condition
- Iatrogenic disease after steroid administration

# Genetic Diabetes Mellitus

## Two Major Types

- ✿ Type I:

- ▢ Insulin-dependent diabetes mellitus (IDDM)

- ✿ Type II:

- ▢ Non-insulin-dependent diabetes mellitus (NIDDM)

# Diabetes Mellitus

- ✿ Results from a deficiency of insulin

Due to:

- low output of insulin from the pancreas

**OR BY**

- peripheral tissues being unresponsive to the insulin

# Symptoms of Type I Diabetes (IDDM)

## ❁ Common symptoms:

→ polydipsia

▢ polyuria

▢ polyphagia

▢ weight loss

▢ loss of strength

## ❁ Other symptoms:

→ bed wetting

▢ skin infections

▢ marked irritability

▢ headache

▢ drowsiness

▢ malaise

▢ dry mouth

# Symptoms of Type II Diabetes (NIDDM)

## ✿ Common symptoms:

- same as IDDM but less commonly seen

- parasthesias / loss of sensation

- ▢ gain or loss of weight

- ▢ Impotence

- ▢ urination at night

- ▢ postural hypotension

- ▢ blurred/decreased vision

# Comparing IDDM and NIDDM

|                                  | <u><b>IDDM</b></u> | <u><b>NIDDM</b></u> |
|----------------------------------|--------------------|---------------------|
| <u><b>% of diabetics</b></u>     | <b>5-10%</b>       | <b>85-90%</b>       |
| <u><b>age at onset</b></u>       | <b>15 y.o</b>      | <b>40+ y.o.</b>     |
| <u><b>body build</b></u>         | <b>normal/thin</b> | <b>obese</b>        |
| <u><b>severity</b></u>           | <b>severe</b>      | <b>mild</b>         |
| <u><b>Insulin dependency</b></u> | <b>almost all</b>  | <b>25-30%</b>       |
| <u><b>oral hypoglycemics</b></u> | <b>few respond</b> | <b>50% respond</b>  |

# Comparing IDDM and NIDDM

|                                 | <u>IDDM</u>    | <u>NIDDM</u> |
|---------------------------------|----------------|--------------|
| <u>ketoacidosis</u>             | common         | uncommon     |
| <u>onset of disease</u>         | rapid          | slow         |
| <u>complications</u>            | 90% in 20 yrs. | Less common  |
| <u>stability</u>                | unstable       | stable       |
| <u>family history</u>           | common         | more common  |
| <u>insulin receptor defects</u> | uncommon       | common       |

# Other complications of Diabetes

- ✿ cataracts
- ✿ blindness
- ✿ hypertension
- ✿ chest pain
- ✿ anemia
- ✿ skin lesions



# Diabetic Ketoacidosis

## ✿ Signs and Symptoms:

- polyuria
- thirst
- fatigue
- nausea
- vomiting
- tachycardia
- tachypnea
- mental  
confusion

# Complications of Diabetes

## ✿ Metabolic

- Inability to utilize glucose in normal amounts
- ▢ Accelerated fat catabolism

## ✿ Blood vessel disease

- ▢ Atherosclerosis
- ▢ Microangiopathy

## ✿ Neurologic

- ▢ Autonomic neuropathy

# Complications of Diabetes

- ✿ Increased incidence of infection due to the three primary manifestations of diabetes:
  1. **Hyperglycemia:** decreases phagocytic function of granulocytes. Facilitates microorganisms to grow.
  2. **Ketoacidosis:** delays migration of granulocytes to injury. Dec. phagocytic activity.
  3. **Vascular Wall Disease:** Vascular insufficiency causing dec. blood flow to injury.
- ✿ End result: Inc. susceptibility to infection, dec. ability to fight infection once started, delayed wound healing

# Diagnosing Diabetes

## ✿ Lab tests demonstrating abnormal glucose metabolism:

### ■ **Fasting Plasma Glucose (FPG)**

**test:** (The “gold standard” lab test). Patient fasts 10-16 hrs. For fasting blood glucose, normal = 70-115mg/100ml of plasma. Results >126mg/100ml with 2 tests = dx. diabetes m.

# Diagnosing Diabetes

## ✿ Lab tests (continued):

- **Oral glucose tolerance test (OGTT):** Dx. impaired glucose tolerance and diabetes mellitus. Do a fasting blood draw and then the patient ingests a 75 gm glucose load. Blood specimens obtained 1/2 hr, 1, 1 1/2 and 2 hours. Dx. diabetes mellitus when the plasma glucose level is  $>200\text{mg}/100\text{ml}$ .
- **Urinary glucose and acetone:** tests glucose and acetone in the urine. Not all diabetics have these in their urine. Not specific for diabetes.

# Oral manifestations of diabetes

- ✿ inc. rate of caries
- ✿ infection
- ✿ xerostomia
- ✿ impaired healing
- ✿ inc. enamel hypoplasia
- ✿ increased gingival inflammation and incidence of periodontal disease
- ✿ abnormal eruption patterns
- ✿ candidiasis

# Dental Management of the diabetic patient

- ✿ determine the status of the diabetic pt.
- ✿ thorough medical history
- ✿ type of diabetes
- ✿ medications
- ✿ ? how they monitor their glucose levels
- ✿ results of last medical evaluation

# Dental management of the NIDDM patient

- ✿ all dental procedures can be done.
- ✿ for dental tx., no special precautions needed unless symptoms of diabetes are present.
- ✿ take normal dosage of oral hypoglycemics for outpatient procedures

# Dental management of the IDDM patient

- ✿ Depends on how well their disease is controlled.
- ✿ If well controlled, routine treatment should be well tolerated using precautions.
- ✿ If poorly controlled IDDM patient, do medical consult.

# Dental management of the IDDM patient

## ✿ Precautions when treating the IDDM pt.

→ Brief morning appts. Dec stress.

- Pt. should take normal insulin dosage and eat normal breakfast. Confirm this with pt.
- Consult physician if procedure will affect the patient's ability to eat. Physician may alter the insulin therapy/diet for patient.

# Dental management of the IDDM patient

## ✿ Precautions (continued):

- ➔ Minimize risk of infection: consider antibiotic coverage after surgery and tx. in presence of suppuration.
- Have a source of sugar available.
- Consider adjunctive sedation.

# Dental management of the diabetic patient

## ✿ If the patient has an acute oral infection:

→ Treat aggressively with definitive therapy such as:

- I&D
- **extraction**
- **pulpectomy**
- Indicated = antibiotic therapy, culture, and medical consultation.
- infection, causing alteration of blood glucose control, can necessitate change in insulin therapy and hospitalization.

# Indications for periodic screening for Diabetes Mellitus

## ✿ Those people who have/are:

- Showing signs or symptoms of diabetes or its complications
- ▢ Diabetic relatives
- ▢ Obese individuals
- ▢ Over 40 years old
- ▢ Delivered large babies
- Spontaneous abortions or stillbirths

# Hypoglycemia

## ✿ Low blood sugar:

- Happens with diabetic and non-diabetic patients
- Blood glucose < 50 mg/ml

# Causes of hypoglycemia

- ✿ Oversecretion of insulin
- ✿ Exertion of muscles
- ✿ Pregnancy
- ✿ Anorexia nervosa

# Hypoglycemia: Insulin shock

- ✿ Usually from pt. not eating normally but still taking their regular insulin therapy.
- ✿ Can occur from overdosage of insulin or oral hypoglycemic medication.
- ✿ Excessive insulin can cause a reaction or shock that occurs in three stages.

# Hypoglycemia: Insulin shock

## ✿ Mild stage:

### ■ Most common

→ Occurs before meals

□ During exercise

□ Lack of food

### ■ Characterized by:

→ Hunger

□ Weakness

□ Trembling

□ Tachycardia

□ Pallor

□ Sweating

□ Parasthesias

# Hypoglycemia: Insulin shock

## ✿ Moderate stage:

- More severe

- Incoherent

- Uncooperative

- Belligerent

- Resistive

- Judgement / orientation = poor

- Driving is the primary danger in this stage

# Hypoglycemia: Insulin shock

## ✿ Severe stage:

- Unconsciousness
- ▢ Presence or absence of seizure activity
- ▢ Hypotension
- ▢ Hypothermia
- ▢ Rapid, thready pulse
- ▢ Sweating

# Dental management of the hypoglycemic patient

## ✿ Mild and moderate stages:

- Recognize hypoglycemic signs and symptoms
- Terminate the procedure
- Give the patient anything containing sugar
- Position the patient; do BLS
- Summon medical assistance if necessary and monitor the patient

# Dental management of the hypoglycemic patient

## ✿ Severe stage:

- Unconscious patient
- Stop the procedure
- Position the patient; do BLS
- Summon medical assistance
- Give 50% IV dextrose or
- 1 mg glucagon IM

# In the life of a diabetic (IDDM)

## My Mom

- ✿ Born on Memorial Day 1936
- ✿ Married at age 19 @128 lbs.
- ✿ Family history of diabetes: aunt and cousin
- ✿ Had 2 children: Cathy (1958) weighing 8 lbs 2 oz. and me (1965) weighing 9 lbs 15 1/2 oz.
- ✿ Mom weighed 185 lbs with Cathy and 213 lbs with me.

# In the life of a diabetic (IDDM)

## My Mom

- ✿ Diagnosed with diabetes in June 1975 during routine check-up: 39 y.o.
- ✿ Used oral hypoglycemics from 1975 until NOV 1989 when she was put on insulin.
- ✿ DEC 1989: in hospital for phlebitis in left leg. and was told to quit work or risk losing the leg
- ✿ Doesn't run the sweeper or iron standing up.

# In the life of a diabetic (IDDM)

## My Mom

- ✿ Diagnosed with kidney problems: 5 yrs. ago
- ✿ Kidneys work at 15% of normal capacity and so she says “my blood is not in good condition”
- ✿ Dialysis? In a year? Kidney transplant, NO!
- ✿ Diet: “Don’t eat too many fruits or vegetables.” No bananas, broccoli, potatoes!

# In the life of a diabetic (IDDM)

## My Mom

- ❁ 1988: Left foot deformed so much she could not wear dress shoes. “Charcot foot”
- ❁ Neuropathy in feet and up to the knees. Could lead to braces.
- ❁ Neuropathy in fingers: Cannot sew because she cannot feel the needle. Buttons are a problem and tearing up mail is a problem

# In the life of a diabetic (IDDM)

## My Mom

- ✿ “Worst thing about my health - get extremely tired.”
- ✿ Fingernails and toenails curl under. “Hammer toes” “Fingernails tell about one’s health.”
- ✿ 1993: laser surgeries on her eyes - 10 surgeries on the left eye and 9 on the right. Would have gone blind in 5 years without tx.

# In the life of a diabetic (IDDM)

## My Mom

- ✿ MAR 1998: Cataract operation on right eye.
- ✿ Can still see well enough to drive and read.

Questions?